WATER RESOURCES REVIEW for

OCTOBER
1975

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

CANADA
DEPARTMENT OF THE ENVIRONMENT
WATER RESOURCES BRANCH

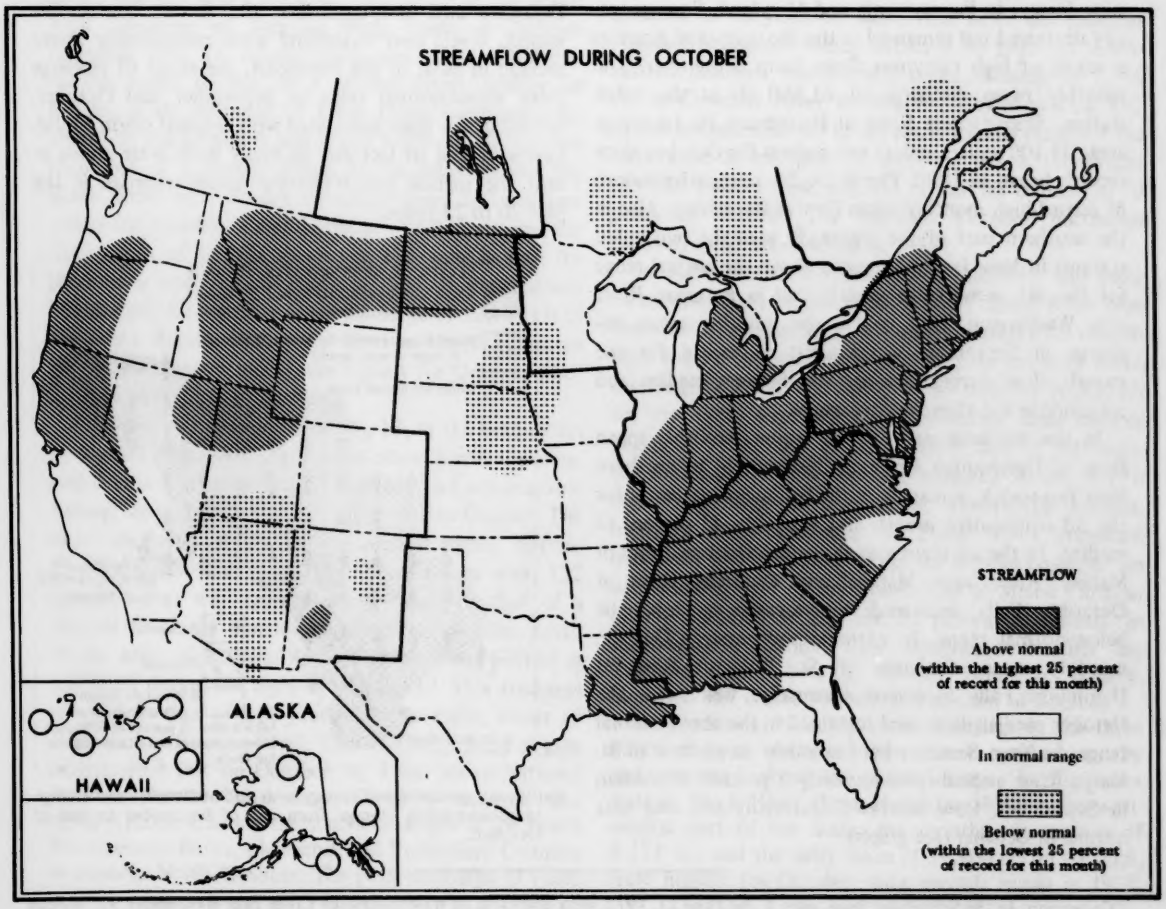
STREAMFLOW AND GROUND–WATER CONDITIONS

Streamflow continued to decrease in parts of southern Canada, and in some central and southern States and Alaska, but generally increased in central Canada, and in many eastern and western States and Hawaii.

Flows remained above normal in large areas in eastern and northwestern United States and in smaller areas in central and western Canada, and below normal in some central States and parts of eastern Canada.

Monthly or daily mean discharges were highest for October in some streams in Alabama, Florida, Kentucky, Mississippi, Ohio, Pennsylvania, and Tennessee.

Flooding occurred in Mississippi, North Carolina, and Ohio.



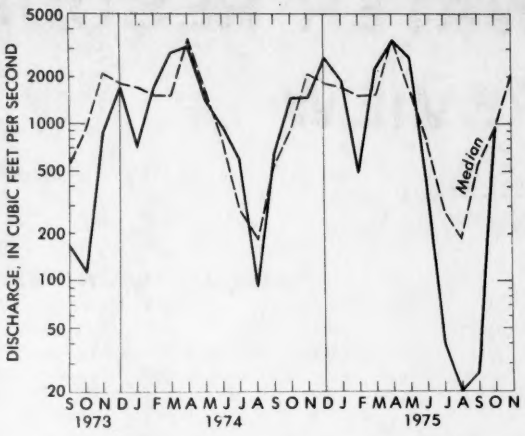
NORTHEAST

[Atlantic Provinces and Quebec; Delaware, Maryland, New York, New Jersey, Pennsylvania, and the New England States]

STREAMFLOW GENERALLY INCREASED SEASONALLY EXCEPT IN MARYLAND, PENNSYLVANIA, AND PARTS OF CONNECTICUT, WHERE FLOWS DECREASED FROM THE ABNORMALLY HIGH FLOWS OF SEPTEMBER. MONTHLY MEAN DISCHARGES REMAINED IN THE ABOVE-NORMAL RANGE IN THE CENTRAL AND SOUTHERN PARTS OF THE REGION AND IN THE BELOW-NORMAL RANGE IN NORTHERN NEW BRUNSWICK. FLOW OF SUSQUEHANNA RIVER AT HARRISBURG WAS HIGHEST FOR OCTOBER SINCE RECORDS BEGAN IN 1890.

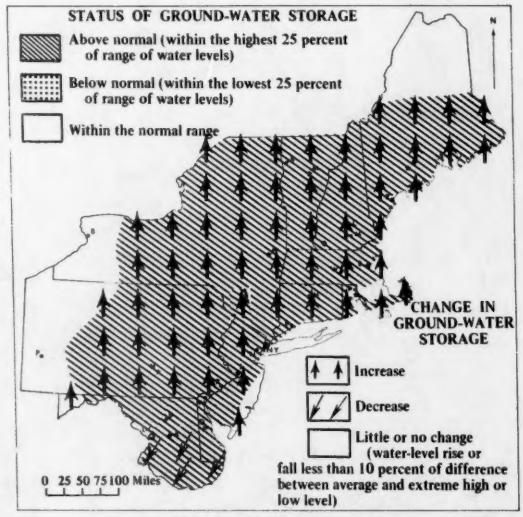
High carryover flows from September, augmented by seasonal increases in flow, held monthly mean discharges generally in the above-normal range in New York, New Jersey, and the New England States. Flows were about 3 to 9 times the October medians at index stations in an area extending from southeastern Quebec to southern New Jersey. In Pennsylvania and Maryland, flows generally decreased but remained in the above-normal range as a result of high carryover flows from September. The monthly mean discharge of 61,660 cfs at the index station, Susquehanna River at Harrisburg, Pa. (drainage area, 24,100 square miles) was highest for October since records began in 1890. This is the 2d consecutive month of record-high monthly mean flow at Harrisburg. Also in the southern part of the region, flow at the two index stations in New Jersey remained above the normal range for the 6th consecutive month, and in Potomac River near Washington, D.C., where the monthly mean discharge in September was highest of record for the month, flow during October was 6 times median and remained in the above-normal range.

In the northern part of the region, monthly mean flow of Upsalquitch River at Upsalquitch, in northern New Brunswick, remained in the below-normal range for the 3d consecutive month and was only 43 percent of median. In the adjacent area of eastern Quebec, flows of Matane River near Matane and Outardes River at Outardes Falls decreased contraseasonally into the below-normal range. In extreme southeastern Quebec, monthly mean discharge of St. Francois River at Hemmings Falls increased seasonally, was twice the October median flow, and remained in the above-normal range. In Nova Scotia, where monthly mean flow of St. Marys River at Stillwater was only 5 percent of median in September, flow increased seasonally and was near normal in October (see graph).



Monthly mean discharge of St. Marys River at Stillwater, Nova Scotia (Drainage area, 523 sq mi; 1,355 sq km)

Ground-water levels rose in most of the region (see map), but changed only slightly in northern Maine, on Long Island, New York, and in some westernmost parts of New York and Pennsylvania; and declined in southern Delaware and Maryland. For the second consecutive month, levels near monthend were considerably above average in most of the Northeast, the result of recharge from above-normal rains in September and October, including the rains associated with tropical storm Eloise. Levels at end of October in many wells were above or near the highest end-of-October levels recorded in the past 20 to 25 years.



Map shows ground-water storage near end of October and change in ground-water storage from end of September to end of October.

[Correction: In the September issue, page 4, the June 22, 1972, peak discharge of West Conewago Creek near Manchester, Pa., should have been shown as 81,700 cfs instead of 18,700 cfs. Also, at the bottom of page 19, the first "4" was accidentally omitted from "0.4047 hectare."]

SOUTHEAST

[Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina, South Carolina, Tennessee, Virginia, and West Virginia]

STREAMFLOW GENERALLY INCREASED CONTRASEASONALLY EXCEPT IN PARTS OF FLORIDA, GEORGIA, NORTH CAROLINA, VIRGINIA, AND WEST VIRGINIA. FLOWS REMAINED ABOVE THE NORMAL RANGE EXCEPT IN PARTS OF FLORIDA, GEORGIA, AND NORTH CAROLINA. MONTHLY AND/OR DAILY MEAN DISCHARGES WERE HIGHEST FOR THE MONTH IN PARTS OF ALABAMA, FLORIDA, KENTUCKY, MISSISSIPPI, AND TENNESSEE. FLOODING OCCURRED IN MISSISSIPPI AND NORTH CAROLINA.

Flooding occurred October 16, 17, along the flood plains of many streams in central and west-central Mississippi. Total rainfall of 5 to 8 inches was reported by the National Weather Service. Substantial urban flooding occurred at Jackson, in the west-central part of the State, and one death there was attributed to the flood. Peak discharge of Hanging Moss Creek at Jackson (drainage area, 16 square miles) was about 4,000 cfs, roughly equal to that of a 10-year flood. Nearby, at Bovina, peak discharge of Clear Creek (drainage area, about 36 square miles) was about 7,200 cfs, slightly less than that of a 50-year flood. At the index station, Big Black River near Bovina (drainage area, 2,810 square miles) the monthly mean discharge of 5,945 cfs, and the daily mean of 16,000 cfs on the 23d, were highest for the month since records began in 1936. In southeastern Mississippi, the monthly mean discharge of 12,180 cfs at the index station, Pascagoula River at Merrill (drainage area, 6,600 square miles) was highest for October since records began in October 1930.

Flooding occurred October 17, 18, in the headwaters of Yadkin River basin in northwestern North Carolina, and resulted in some loss of livestock and considerable damage to highways and bridges in Wilkes County. The peak discharge of 22,900 cfs at the gaging station, Roaring River near Roaring River (drainage area, 122 square miles) was approximately equal to that of a 50-year flood. At North Wilkesboro, a few miles south of the town of Roaring River, Reddies River peaked at 8,300 cfs during the night of October 17. This discharge is equal to that of a 30-year flood. At Elkin, about 15 miles east of Roaring River, Yadkin River crested at gage height, 20.8 feet on October 18, 5 feet above National Weather Service flood stage. Flooding occurred also along streams draining the southeast slopes of the South Mountains in Burke, Cleveland, and Rutherford Counties in western North Carolina. The peak discharge of 7,800 cfs at the gaging station, First Broad River near Casar (drainage area, 59.5 square miles), in Cleveland County, was slightly greater than that of a 50-year flood and was the maximum discharge observed at that site since the record began in 1959. In Burke County, the peak discharge of 6,000 cfs at the gaging station, Jacob Fork at Ramsey (drainage area, 25.4 square miles) was the maximum observed since records began in 1961 and was equal to that of a 15-year flood. Also in western North Carolina, monthly mean discharges at the index stations, French Broad River at Asheville and South Yadkin River near Mocksville, increased seasonally and were about twice the October median flows, and were above the normal range. In the eastern part of the State, flows generally were greater than median but were within the normal range.

In Alabama, high carryover flow from September, augmented by runoff from several rains during October, resulted in record-high monthly mean discharges at the index stations. In the central part of the State the mean discharge of 1,652 cfs in Cahaba River at Centreville (drainage area, 1,029 square miles) was highest for October in 49 years of record and twice the previous October maximum which occurred in 1929. In southeastern Alabama, the monthly mean discharge of 1,756 cfs in Conecuh River at Brantley (drainage area, 492 square miles) remained in the above-normal range for the 10th time in the past 11 months, was 12 times the October median flow, and was highest for October in 39 years of record. The previous October maximum monthly mean was 640 cfs in 1965.

In northwestern Florida, where monthly and daily mean discharges at the index station, Shoal River near Crestview (drainage area, 474 square miles) were record-high in both August and September, the monthly mean discharge of 3,830 cfs, and the daily mean of 10,300 cfs on the 19th, were highest for October since records began in 1938. Also in the northern part of the State, the discharge of Silver Springs increased 20 cfs, to 670 cfs; 79 percent of normal. In west-central Florida, monthly mean discharge of Peace River decreased seasonally and remained within the normal range. In the southeastern part of the State, flow of Miami Canal at Miami remained at 250 cfs; 52 percent of normal. In southwestern Florida, flow southward through the Tamiami Canal outlets, 40-mile bend to Monroe, increased 467 cfs, to 998 cfs; 171 percent of normal.

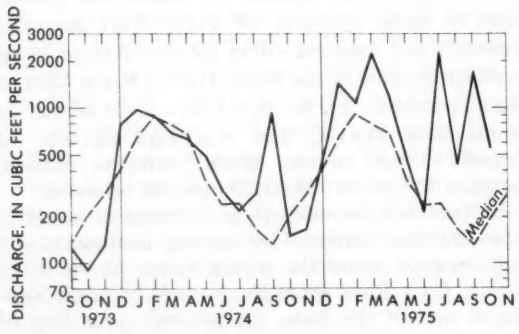
In Tennessee, monthly mean discharge at the three index stations continued to increase contraseasonally and remained above the normal range. At the index station, Duck River above Hurricane Mills, in the west-central part of the State, the monthly mean flow of 8,517 cfs, and the daily mean of 34,100 cfs on the 21st, were highest for October since records began in 1925.

This monthly mean discharge is 13 times the October median flow. Also in west-central Tennessee, at the index station Harpeth River near Kingston Springs (drainage area, 681 square miles) the monthly mean discharge of 1,551 cfs, and the daily mean of 11,200 cfs on the 18th, were highest for the month since records began in 1925. This monthly mean discharge is 17 times the median for October. In eastern Tennessee, where monthly mean flow of Emory River at Oakdale (drainage area, 764 square miles) was 973 cfs (20 times median) in September, flow increased sharply, to 2,062 cfs (37 times median) and was highest for October since records began in 1927. The daily mean discharge of 13,100 cfs on the 17th also was highest for October in the period of record.

In south-central Kentucky, where monthly mean discharge of Green River at Munfordville (drainage area, 1,673 square miles) was 5 times median and above the normal range in September, flow increased sharply during October and the monthly mean discharge of 4,479 cfs was about 19 times median and highest for the month in 50 years of record. In the northern part of the State, flow at the index station Licking River at Catawba (drainage area, 3,300 square miles) also increased sharply and was 44 times the October median. The monthly mean discharge of 7,247 cfs and the daily mean of 44,900 cfs on the 18th, were highest for October in 50 years of record.

In West Virginia, monthly mean discharges generally remained in the above-normal range and were 2 to 5 times the October median flows.

In Virginia, flows decreased contraseasonally from the unusually high monthly mean discharges of September but remained in the above-normal range, except in the extreme western part of the State where monthly mean flow of North Fork Holston River near Saltville decreased into the normal range. The decreasing pattern of flow of Nottaway River near Stony Creek, in southeastern Virginia, is generally typical of that for other streams in the State (see graph).



Monthly mean discharge of Nottaway River near Stony Creek, Va. (Drainage area, 579 sq mi; 1,500 sq km)

Ground-water levels rose in most of West Virginia, Alabama, and Mississippi, and also in central Florida and in the Piedmont of Georgia. Levels declined in North Carolina, much of Kentucky (except in areas of locally heavy rains), and in northern Florida; and changed only slightly in southeastern Florida. In heavily pumped areas of coastal Georgia, levels changed only slightly at Savannah and declined in the Brunswick area. Monthend levels were generally above average in West Virginia (except in a few central counties), Kentucky, North Carolina, Alabama, and in the Piedmont of Georgia. Levels were below average in southeastern Florida.

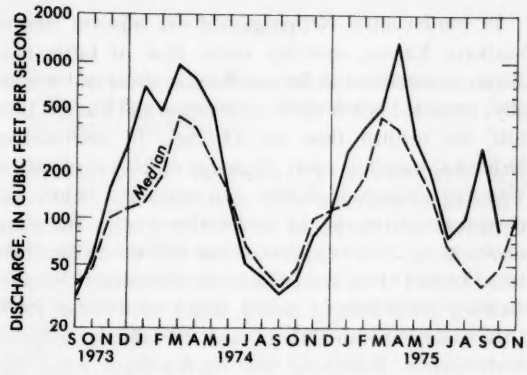
WESTERN GREAT LAKES REGION

[Ontario; Illinois, Indiana, Michigan, Minnesota, Ohio, and Wisconsin]

STREAMFLOW INCREASED SEASONALLY IN SOUTHERN ONTARIO BUT REMAINED IN THE BELOW-NORMAL RANGE. FLOWS GENERALLY DECREASED SEASONALLY ELSEWHERE IN THE REGION EXCEPT IN EASTERN OHIO, WHERE MINOR FLOODING OCCURRED, AND IN PARTS OF INDIANA, ILLINOIS, AND MINNESOTA. FLOWS REMAINED ABOVE THE NORMAL RANGE IN MICHIGAN AND OHIO, AND IN PARTS OF INDIANA AND ILLINOIS, AND BELOW THAT RANGE IN SOUTHWESTERN MINNESOTA.

Minor flooding occurred on the 18th in east-central and southeastern parts of Ohio as a result of rapid runoff from heavy rains. In the extreme eastern part of the State, high carryover flow from September, augmented by increased flow on the 18th, resulted in a monthly mean discharge of 760 cfs at the index station, Little Beaver Creek near East Liverpool (drainage area, 496 square miles), which was 10 times the October median flow and in the above-normal range. In central Ohio, where mean flow of Scioto River at Higby (drainage area, 5,131 square miles) during September was 5 times median and above the normal range, monthly mean discharge increased during October (as a result of runoff from heavy rain on October 17, 18), was 5 times the October median flow, and remained in the above-normal range. The daily mean discharge of 15,300 cfs on the 18th was highest for the month since records began in October 1930.

In the adjacent area of Michigan's Lower Peninsula, monthly mean discharge at the index station, Red Cedar River at Lansing, decreased contraseasonally from the record-high flow of September but remained in the above-normal range for the 3d consecutive month and was greater than median for the 12th consecutive month (see graph). Also in the Lower Peninsula, flow at the



Monthly mean discharge of Red Cedar River at East Lansing, Mich. (Drainage area, 355 sq mi; 919 sq km)

index station, Muskegon River at Evart, also decreased contraseasonally but remained in the above-normal range where it has been for the past 5 months. In the Upper Peninsula, where mean flow of Sturgeon River near Sidnaw was above the normal range in September, flow decreased contraseasonally and the monthly mean was less than the October median.

In western Indiana and the adjacent area of eastern Illinois, high carryover flow from September, augmented by increased flow during the period of rainfall, October 16–20, resulted in a monthly mean discharge of 8,453 cfs in Wabash River at Mt. Carmel, Illinois (drainage area, 28,635 square miles) which was in the above-normal range and twice the October median flow. In southeastern Indiana, monthly mean flow of East Fork White River at Shoals (drainage area, 4,927 square miles) increased to 1,740 cfs, which is 3 times the median flow for the month.

In central Illinois, where mean discharge at the index station, Sangamon River at Monticello, was 5 times median in September, monthly mean flow increased to 8 times median in October and remained in the above-normal range for the 3d consecutive month.

In southwestern Minnesota, flow of Minnesota River at the index station near Jordan continued to decrease seasonally, remained below the normal range and about 40 percent of median, for the 3d consecutive month. At other index stations in the State, monthly discharges were either slightly higher or lower than median in October.

In southwestern Ontario, monthly mean discharge at the index station, English River at Umfreville, increased slightly but remained below the normal range for the 3d consecutive month and was only 46 percent of median. In the southeastern part of the Province, monthly mean flow at the index station, Missinaibi River at Mattice, also increased but remained in the below-normal range for the 6th time in the past 7 months and was only 32 percent of median.

Ground-water levels generally declined in water-table wells in Minnesota and Michigan, and changed only slightly in Ohio. However, levels near end of month remained above average in Ohio and Michigan as a result of recharge from the above-normal rains of September, and included highest end-of-October levels in 20 or 30 years in parts of central Ohio and Michigan's Lower Peninsula. In Minnesota, monthend levels were mostly below average, including those in the heavily pumped artesian aquifers of the Minneapolis-St. Paul area where levels continued rising in the Prairie du Chien-Jordan aquifer and in the deeper Mt. Simon-Hinckley aquifer.

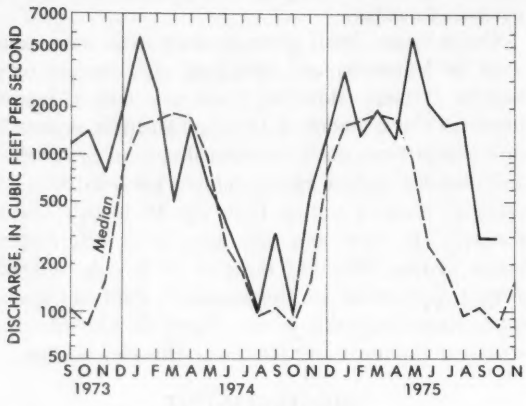
MIDCONTINENT

[Manitoba and Saskatchewan; Arkansas, Iowa, Kansas, Louisiana, Missouri, Nebraska, North Dakota, Oklahoma, South Dakota, and Texas]

STREAMFLOW GENERALLY DECREASED SEASONALLY EXCEPT IN PARTS OF NEBRASKA, NORTH DAKOTA, AND TEXAS. FLOWS REMAINED ABOVE THE NORMAL RANGE IN PARTS OF LOUISIANA, AND NORTH DAKOTA, AND BELOW THAT RANGE IN PARTS OF NEBRASKA AND KANSAS. MINOR FLOODING OCCURRED IN EASTERN LOUISIANA.

Runoff from intense rains in the upper reaches of Pearl River basin (in southern Mississippi) at midmonth, resulted in minor flooding along that stream near Bogalusa, in extreme southeastern Louisiana, where the river level remained above National Weather Service flood stage October 19 to 31, and the monthly mean discharge at the index station, Pearl River near Bogalusa, remained above the normal range for the 6th consecutive month. Also in southeastern Louisiana, where monthly mean discharge of Amite River near Denham Springs was highest for the month in both August and September, high carryover flow, augmented by runoff from October rains, held monthly mean flow above the normal range for the 6th consecutive month. In the southwestern part of the State, monthly mean discharge at the index station, Calcasieu River near Oberlin, was 4 times the October median flow and above the normal range for the 6th consecutive month (see graph on page 6). In northwestern Louisiana, monthly mean flow of Saline Bayou near Lucky was above the normal range for the 13th time in the past 14 months.

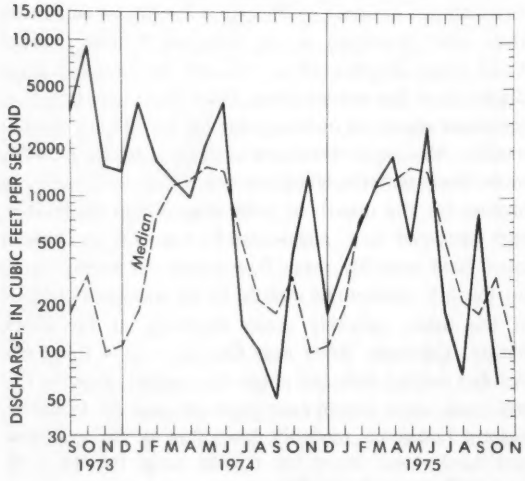
In the adjacent area of eastern Texas, monthly mean flow of Neches River near Rockland increased sharply and was about 3 times the median flow for the month. In the south-central part of the State, where monthly mean discharge at the index station, Guadalupe River



Monthly mean discharge of Calcasieu River near Oberlin, La.
(Drainage area 753 sq mi; 1,950 sq km)

near Spring Branch (drainage area, 1,315 square miles) was above the normal range continuously from November 1974 to August 1975, high carryover flow from September, augmented by runoff from rains near monthend, resulted in a monthly mean discharge of 236 cfs (more than twice the October median flow).

In northwestern Missouri, where the monthly mean discharge of Grand River near Gallatin was about 5 times median in September, flow decreased sharply during October and the mean discharge was only 21 percent of median (see graph). In the southern part of the State,



Monthly mean discharge of Grand River near Gallatin, Mo.
(Drainage area, 2,250 sq mi; 5,830 sq km)

flow of Gasconade River at Jerome also decreased seasonally but the monthly mean discharge remained well above the median.

In south-central Nebraska, and the adjacent area of northern Kansas, monthly mean flow of Little Blue River, as measured at Barnes, Kansas, decreased seasonally, remained below the normal range, and was less than half the median flow for October. In northeastern Nebraska, monthly mean discharge of Elkhorn River at Waterloo increased slightly but remained below the normal range for the 3d consecutive month. The mean discharge of 294 cfs was about one-half the median flow for October but was twice the minimum October monthly mean flow of record, which occurred in 1939.

In eastern South Dakota, and the adjacent areas of southwestern Minnesota and northwestern Iowa, the monthly mean discharge of 114 cfs in Big Sioux River, as measured at Akron, Iowa, was only 45 percent of median but was more than 3 times the minimum October monthly mean discharge of record, which occurred in 1958.

In eastern North Dakota, high carryover flow from September held monthly mean discharge of Red River of the North at Grand Forks above the normal range for the 11th time in the past 12 months. In the western part of the State, runoff from rain and melting snow at midmonth resulted in monthly mean flows that were above the normal range.

In central South Dakota, flow did not occur at the index station, Bad River near Fort Pierre during the entire month.

In south-central Manitoba, monthly mean discharge of Waterhen River below Waterhen Lake continued to decrease seasonally but was above the normal range for the 16th time in the past 18 months. Also in the south-central part of the Province, the level of Lake Winnipeg at Gimli averaged 715.91 feet above mean sea level, 2.33 feet higher than the October long-term mean, 0.45 foot lower than last month, and 0.50 foot lower than a year ago.

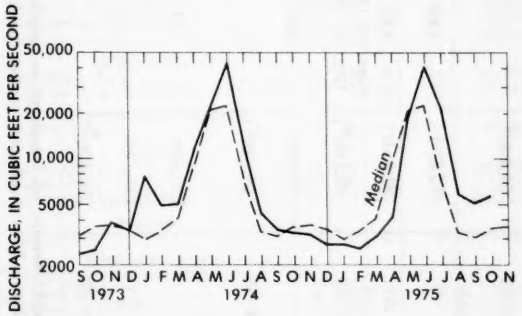
Ground-water levels declined in nearly the entire region; principal exceptions were in those heavily pumped areas where pumpage had been reduced such as in parts of Kansas, east-central Arkansas, and southwestern Louisiana. Monthend levels in North Dakota were again above average in northwestern and southwestern parts of the State. In the industrial aquifer of central and southern Arkansas (Sparta Sand), the level in the key well at Pine Bluff was unchanged and was more than 15 feet below average, whereas at El Dorado the level rose and was only slightly below average. In Texas, levels rose in the Edwards Limestone at San Antonio; but declined in the Edwards Limestone at Austin, in the Evangeline aquifer at Houston, and in the bolson deposits at El Paso. Monthend levels were above average at Austin and San Antonio, and below average at Houston and El Paso.

WEST

[Alberta and British Columbia; Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, and Wyoming]

STREAMFLOW GENERALLY DECREASED SEASONALLY IN ALBERTA AND BRITISH COLUMBIA, AND IN THE EASTERN STATES OF THE REGION, BUT INCREASED SEASONALLY IN VANCOUVER ISLAND AND THE NORTHWESTERN STATES, AND IN CALIFORNIA AND NEVADA. MONTHLY MEAN FLOWS REMAINED IN THE ABOVE-NORMAL RANGE IN LARGE AREAS IN THE WESTERN AND NORTH-CENTRAL PARTS OF THE REGION AND DECREASED INTO THE BELOW-NORMAL RANGE IN PARTS OF ALBERTA, BRITISH COLUMBIA, ARIZONA, NEW MEXICO, AND UTAH.

High carryover flows from September, augmented by runoff from above-normal precipitation, held monthly mean discharges above the normal range for the 5th consecutive month at the index stations, Salmon River at Whitebird and Clearwater River at Spalding, in north-central Idaho. Monthly mean flow also remained above the normal range for the 5th consecutive month at the index station, Clark Fork at St. Regis, in the adjacent area of Montana (see graph) as a result of high carryover



Monthly mean discharge of Clark Fork at St. Regis, Mont. (Drainage area, 10,709 sq mi; 27,736 sq km)

flow, augmented by runoff from snow and rain storms during the second and third weeks of the month. Monthly mean discharges also were above the normal range in Yellowstone River at index stations at Corwin Springs and Billings, in south-central Montana, and in Snake River basin in the adjacent areas in western Wyoming and eastern Idaho. Monthly precipitation was reported to be 2 to 3 times normal in this Idaho-Wyoming area.

In northeastern Nevada, monthly mean discharge of Humboldt River at Palisade increased seasonally and remained above the normal range for the 6th consecutive month, partly as a result of high carryover flow from September. In the adjacent area of northern Utah, monthly mean flows decreased seasonally at the index stations, Big Cottonwood Creek near Salt Lake City and Weber River near Oakley, but remained above the normal range for the 5th consecutive month as a result of high carryover flow. Also in northern Utah, the level of Great Salt Lake, which was 4,199.95 feet above mean sea level September 30, receded to a seasonal low level of 4,199.90 feet on October 15, then rose to 4,200.05 feet on October 31, 0.10 foot higher than a month ago, 0.75 foot higher than a year ago, and 8.70 feet above the alltime record low of October 1963.

In northern California and the adjacent area of southern Oregon, monthly mean flows increased as a result of runoff from two major storms. Intense rains in northern California during the week of October 4–10 were followed by rainfall amounts reported to have ranged from 3 to 7 inches in south-coastal Oregon and northern California, October 25, 26. In north-coastal California, monthly mean flow of Smith River near Crescent City (drainage area, 609 square miles) increased sharply, from 258 cfs (93 percent of median) in September to 1,823 cfs (314 percent of median) in October. In south-coastal Oregon, monthly mean discharge at the index station, Umpqua River near Elkton, also increased sharply and remained above the normal range for the 6th consecutive month. In the adjacent basin of Willamette River, in west-central Oregon, monthly mean flow at the index station at Salem increased seasonally and was above the normal range for the 3d consecutive month. In north-central California, monthly mean discharges at the index stations, North Fork American River at North Fork Dam, West Walker River below Little Walker River, near Coleville, and Kings River above North Fork, near Trimmer, increased into the above-normal range and were about twice their respective median flows for October.

In British Columbia, monthly mean flow of Sproat River near Alberni, on Vancouver Island, increased seasonally (was 3 times the October median) and remained above the normal range. In the west-central part of the Province, monthly mean discharge at the index station, Skeena River at Usk, decreased contra-seasonally and was below the normal range. In southern Alberta, monthly mean flow of Bow River at Banff also decreased into the below-normal range. Monthly mean discharges at that index station have been less than the respective monthly medians continuously since January 1975 and were in the below-normal range 5 times in the 10-month period.

In the southern part of the region, monthly mean flows decreased seasonally and were below the normal range in parts of Arizona, New Mexico, and Utah. In northeastern Arizona, where monthly mean discharge of Little Colorado River near Cameron was more than twice the median flow in September, mean flow in October was only 6 percent of median. In the adjacent

Provisional data; subject to revision

DISSOLVED SOLIDS AND WATER TEMPERATURES FOR OCTOBER AT DOWNSTREAM SITES ON SIX LARGE RIVERS

Station number	Station name	October data of following calendar years	Stream discharge during month, Mean (cfs)	Dissolved-solids concentration during month[a], Minimum (mg/l)	Dissolved-solids concentration during month[a], Maximum (mg/l)	Dissolved-solids discharge during month[a], Mean (tons per day)	Dissolved-solids discharge during month[a], Minimum (tons per day)	Dissolved-solids discharge during month[a], Maximum (tons per day)	Water temperature during month, Mean, in °C	Water temperature during month, Minimum, in °C	Water temperature during month, Maximum, in °C
	NORTHEAST										
01463500	Delaware River at Trenton, N.J.	1975*	18,339	.....	.....	.....	.....	.....	.....	.....	.....
	(Morrisville, Pa.)	1944–73	5,561	61 (Oct. 11–20, 1955)	156 (Oct. 1–9, 1953)	.....	441 (Oct. 30, 1963)	8,280 (Oct. 11–20, 1955)	.....	6.0 (43°F)	26 (78°F)
		[1940–69	4,025[b]]								
04264331	St. Lawrence River at Cornwall, Ontario, near	1975	289,000	167	168	130,000	127,000	132,000	14.0 (57°F)	12.5 (36°F)	16.0 (61°F)
	Massena, N.Y. (discharge station formerly at	1966–73	264,000	.....	.....	.....	.....	.....	.....	10.0 (50°F)	19 (66°F)
	Ogdensburg, N.Y.)	[1940–69	234,500[b]]								
	SOUTHEAST										
07289000	Mississippi River at Vicksburg, Miss.	1975	441,400	192	258	275,000	228,000	338,000	19.6 (67°F)	17.6 (63°F)	23.1 (76°F)
		[1940–69	264,200[b]]								
	WESTERN GREAT LAKES REGION										
03612500	Ohio River at lock and dam 53, near Grand Chain, Ill.	1975	272,600	158	264	.....	51,400	240,000	.....	17 (63°F)	23 (73°F)
	(25 miles west of Paducah, Ky.; discharge station at	1954–69, 1972–73	91,160	135 (Oct. 10, 1960; Oct. 24, 1963)	330 (Oct. 9, 1967)	.....	15,000 (Oct. 25, 1973)	244,000 (Oct. 26, 1954)	.....	12 (54°F)	26 (78°F)
	Metropolis, Ill.)	[1940–69	89,100[b]]								
	MIDCONTINENT										
06934500	Missouri River at Hermann, Mo. (60 miles west of St.	1975	79,800	383	456	91,800	85,600	98,900	16.5 (62°F)	13.5 (56°F)	20.0 (68°F)
	Louis, Mo.)	[1940–69	55,340[b]]								
	WEST										
14128910	Columbia River at Warrendale, Oreg.	1975	115,800	97	108	31,900	26,800	48,900	.....	15.0 (59°F)	19.6 (67°F)
	(30 miles east of Portland, Oreg.; discharge station at	1967–73	114,700	.....	.....	.....	.....	.....	.....	11.5 (53°F)	19 (66°F)
	The Dalles, Oreg.)	[1940–69	100,400[b]]								

[a] Dissolved-solids concentrations when not analyzed directly, are calculated on basis of measurements of specific conductance.
[b] Median of monthly discharges for this month during 30-year reference period, for comparison with data for current month.
*Water-quality monitoring station temporarily out of operation (October 1975).

USABLE CONTENTS OF SELECTED RESERVORIS NEAR END OF OCTOBER 1975

[Contents are expressed in percent of reservoir capacity. The usable storage capacity of each reservoir is shown in the column headed "Normal maximum."]

Reservoir Principal uses: F–Flood control I–Irrigation M–Municipal P–Power R–Recreation W–Industrial	End of Sept. 1975	End of Oct. 1975	End of Oct. 1974	Average for end of Oct.	Normal maximum
	Percent of normal maximum				
NORTHEAST REGION					
NOVA SCOTIA					
Rossignol, Mulgrave, Falls Lake, St. Margaret's Bay, Black, and Ponhook Reservoirs (P)	31	28	41	.....	223,400 (a)
QUEBEC					
Allard (P)	84	90	62	55	280,600 ac-ft
Gouin (P)	79	82	89	65	6,954,000 ac-ft
MAINE					
Seven reservoir systems (MP)	53	52	51	50	178,500 mcf
NEW HAMPSHIRE					
First Connecticut Lake (P)	83	68	64	76	3,330 mcf
Lake Francis (FPR)	95	92	78	75	4,326 mcf
Lake Winnipesaukee (PR)	82	82	65	53	7,200 mcf
VERMONT					
Harriman (P)	78	79	50	60	5,060 mcf
Somerset (P)	92	92	68	67	2,500 mcf
MASSACHUSETTS					
Cobble Mountain and Borden Brook (MP)	87	82	69	71	3,394 mcf
NEW YORK					
Great Sacandaga Lake (FPR)	84	79	56	55	34,270 mcf
Indian Lake (FMP)	111	97	92	52	4,500 mcf
New York City reservoir system (MW)	91	96	82	.....	547,500 mg
NEW JERSEY					
Wanaque (M)	101	101	64	63	27,730 mg
PENNSYLVANIA					
Pymatuning (FMR)	94	95	92	76	8,191 mcf
Wallenpaupack (P)	66	72	55	46	6,875 mcf
MARYLAND					
Baltimore municipal system (M)	102	99	91	83	85,340 mg
SOUTHEAST REGION					
NORTH CAROLINA					
Bridgewater (Lake James) (P)	100	98	83	79	12,580 mcf
Narrows (Badin Lake) (P)	97	97	93	95	5,617 mcf
High Rock Lake (P)	45	91	42	57	10,230 mcf
SOUTH CAROLINA					
Lake Murray (P)	79	78	76	60	70,300 mcf
Lakes Marion and Moultrie (P)	85	75	80	63	81,100 mcf
SOUTH CAROLINA--GEORGIA					
Clark Hill (FP)	78	74	61	51	75,360 mcf
GEORGIA					
Burton (PR)	88	84	87	64	104,000 ac-ft
Sinclair (MPR)	93	86	83	70	214,000 ac-ft
Lake Sidney Lanier (FMPR)	64	64	55	48	1,686,000 ac-ft
ALABAMA					
Lake Martin (P)	94	87	84	64	1,373,000 ac-ft
TENNESSEE VALLEY					
Clinch Projects: Norris and Melton Hill Lakes (FPR)	34	33	31	32	1,156,000 cfsd
Douglas Lake (FPR)	30	39	23	22	703,100 cfsd
Hiwassee Projects: Chatuge, Nottely, Hiwassee, Apalachia, Blue Ridge, Ocoee 3, and Parksville Lakes (FPR)	53	56	49	48	510,300 cfsd
Holston Projects: South Holston, Watauga, Boone, Fort Patrick Henry, and Cherokee Lakes (FPR)	44	44	47	37	1,452,000 cfsd
Little Tennessee Projects: Nantahala, Thorpe, Fontana, and Chilhowee Lakes (FPR)	46	48	44	47	745,200 cfsd
WESTERN GREAT LAKES REGION					
WISCONSIN					
Chippewa and Flambeau (PR)	73	76	85	75	15,900 mcf
Wisconsin River (21 reservoirs) (PR)	58	47	56	62	17,400 mcf
MINNESOTA					
Mississippi River headwater system (FMR)	34	28	33	29	1,640,000 ac-ft
MIDCONTINENT REGION					
NORTH DAKOTA					
Lake Sakakawea (Garrison) (FIPR)	97	94	92	.....	22,640,000 ac-ft
SOUTH DAKOTA					
Angostura (I)	60	59	61	74	127,600 ac-ft
Bell Fourche (I)	26	25	25	36	185,200 ac-ft
Lake Francis Case (FIP)	67	61	63	56	4,834,000 ac-ft
Lake Oahe (FIP)	94	88	79	.....	22,530,000 ac-ft
Lake Sharpe (FIP)	100	102	102	90	1,725,000 ac-ft
Lewis and Clarke Lake (FIP)	96	97	95	89	477,000 ac-ft

Reservoir Principal uses: F–Flood control I–Irrigation M–Municipal P–Power R–Recreation W–Industrial	End of Sept. 1975	End of Oct. 1975	End of Oct. 1974	Average for end of Oct.	Normal maximum
	Percent of normal maximum				
MIDCONTINENT REGION--Continued					
NEBRASKA					
Lake McConaughy (IP)	67	70	70	66	1,948,000 ac-ft
OKLAHOMA					
Eufaula (FPR)	89	82	97	85	2,378,000 ac-ft
Keystone (FPR)	76	75	100	91	661,000 ac-ft
Tenkiller Ferry (FPR)	107	99	102	89	628,200 ac-ft
Lake Altus (FIMR)	89	87	32	46	134,500 ac-ft
Lake O'The Cherokees (FPR)	81	75	90	82	1,492,000 ac-ft
OKLAHOMA--TEXAS					
Lake Texoma (FMPRW)	98	94	101	92	2,722,000 ac-ft
TEXAS					
Bridgeport (IMW)	99	92	44	42	386,400 ac-ft
Canyon (FMR)	90	90	98	62	385,600 ac-ft
International Amistad (FIMPW)	100	100	100	66	3,497,000 ac-ft
International Falcon (FIMPW)	89	....	92	74	2,667,000 ac-ft
Livingston (IMW)	99	100	100	62	1,788,000 ac-ft
Possum Kingdom (IMPRW)	93	93	98	102	569,400 ac-ft
Red Bluff (PI)	38	36	46	27	307,000 ac-ft
Toledo Bend (P)	85	85	87	69	4,472,000 ac-ft
Twin Buttes (FIM)	94	94	96	9	177,800 ac-ft
Lake Kemp (IMW)	84	83	51	89	268,000 ac-ft
Lake Meredith (FMW)	48	46	49	37	821,300 ac-ft
Lake Travis (FIMPRW)	91	91	100	77	1,144,000 ac-ft
THE WEST					
WASHINGTON					
Ross (PR)	98	96	94	84	1,052,000 ac-ft
Franklin D. Roosevelt Lake (IP)	95	93	97	97	5,232,000 ac-ft
Lake Chelan (PR)	90	76	76	73	676,100 ac-ft
Lake Cushman	96	101	78	86	359,500 ac-ft
Lake Merwin (P)	102	101	102	83	246,000 ac-ft
IDAHO					
Boise River (4 reservoirs) (FIP)	51	57	48	47	1,235,000 ac-ft
Coeur d'Alene Lake (P)	95	62	60	53	238,500 ac-ft
Pend Oreille Lake (FP)	87	62	54	74	1,561,000 ac-ft
IDAHO--WYOMING					
Upper Snake River (7 reservoirs) (MP)	61	62	58	51	4,282,000 ac-ft
WYOMING					
Boysen (FIP)	91	88	86	82	802,000 ac-ft
Buffalo Bill (IP)	75	67	68	75	421,300 ac-ft
Keyhole (F)	69	68	69	38	199,900 ac-ft
Pathfinder, Seminoe, Alcova, Kortes, Glendo, and Guernsey Reservoirs (I)	60	60	59	40	3,056,000 ac-ft
COLORADO					
John Martin (FIR)	0	0	0	12	364,400 ac-ft
Taylor Park (IR)	88	79	65	52	106,200 ac-ft
Colorado–Big Thompson project (I)	75	71	68	55	722,600 ac-ft
COLORADO RIVER STORAGE PROJECT					
Lake Powell; Flaming Gorge, Navajo, and Blue Mesa Reservoirs (IFPR)	83	82	73	.....	31,280,000 ac-ft
UTAH--IDAHO					
Bear Lake (IPR)	86	81	78	57	1,421,000 ac-ft
CALIFORNIA					
Folsom (FIP)	78	72	69	53	1,000,000 ac-ft
Hetch Hetchy (MP)	75	66	63	47	360,400 ac-ft
Isabella (FIR)	32	31	45	22	551,800 ac-ft
Pine Flat (FI)	36	39	46	35	1,014,000 ac-ft
Clair Engle Lake (Lewiston) (P)	84	80	76	72	2,438,000 ac-ft
Lake Almanor (P)	88	88	89	46	1,036,000 ac-ft
Lake Berryessa (FIMW)	87	86	87	75	1,600,000 ac-ft
Millerton Lake (FI)	32	34	29	31	503,200 ac-ft
Shasta Lake (FIPR)	82	80	81	64	4,377,000 ac-ft
CALIFORNIA--NEVADA					
Lake Tahoe (IPR)	80	78	78	49	744,600 ac-ft
NEVADA					
Rye Patch (I)	90	81	62	.....	157,200 ac-ft
ARIZONA--NEVADA					
Lake Mead and Lake Mohave (FIMP)	77	77	74	68	27,970,000 ac-ft
ARIZONA					
San Carlos (IP)	13	12	26	12	1,093,000 ac-ft
Salt and Verde River system (IMPR)	52	50	49	33	2,073,000 ac-ft
NEW MEXICO					
Conchas (FIR)	26	23	37	77	352,600 ac-ft
Elephant Butte and Caballo (FIPR)	21	21	15	24	2,539,000 ac-ft

[a]Thousands of kilowatt-hours

FLOW OF LARGE RIVERS DURING OCTOBER 1975

Station number*	Stream and place of determination	Drainage area (square miles)	Mean annual discharge through September 1970 (cfs)	October 1975					
				Monthly discharge (cfs)	Percent of median monthly discharge, 1941–70	Change in discharge from previous month (percent)	Discharge near end of month		
							(cfs)	(mgd)	Date
1–0140	St. John River below Fish River at Fort Kent, Maine.	5,690	9,397	4,933	105	+58	4,600	3,000	31
1–3185	Hudson River at Hadley, N.Y	1,664	2,791	3,758	312	+36	3,000	1,900	31
1–3575	Mohawk River at Cohoes, N.Y	3,456	5,450	7,900	346	+27	.....	.....	...
1–4635	Delaware River at Trenton, N.J	6,780	11,360	18,160	451	+50	16,300	10,500	28
1–5705	Susquehanna River at Harrisburg, Pa.	24,100	33,670	61,660	784	-17	34,100	22,000	31
1–6465	Potomac River near Washington, D.C.	11,560	[1] 10,640	17,850	627	-30	10,150	6,560	31
2–1055	Cape Fear River at William O. Huske Lock near Tarheel, N.C.	4,810	4,847	3,370	160	-38	1,090	700	31
2–1310	Pee Dee River at Peedee, S.C	8,830	9,098	10,300	221	+7	8,840	5,710	29
2–2260	Altamaha River at Doctortown, Ga.	13,600	13,380	13,230	250	+51	15,000	9,700	25
2–3205	Suwannee River at Branford, Fla	7,740	6,775	5,440	118	-21	4,810	3,110	31
2–3580	Apalachicola River at Chattahoochee, Fla.	17,200	21,690	28,800	264	+73	19,900	12,900	30
2–4670	Tombigbee River at Demopolis lock and dam near Coatopa, Ala.	15,400	21,700	32,630	1,218	+359	15,800	10,200	30
2–4895	Pearl River near Bogalusa, La	6,630	8,533	10,100	507	+124	21,500	13,900	28
3–0495	Allegheny River at Natrona, Pa	11,410	[1] 18,700	20,670	473	+10	17,000	11,000	30
3–0850	Monongahela River at Braddock, Pa.	7,337	[1] 11,950	9,984	317	-20	7,400	4,780	30
3–1930	Kanawha River at Kanawha Falls, W.Va.	8,367	12,370	9,162	202	-5	7,500	4,850	30
3–2345	Scioto River at Higby, Ohio	5,131	4,337	2,933	503	+1	2,060	1,330	28
3–2945	Ohio River at Louisville, Ky[2]	91,170	110,600	106,700	474	+16	74,200	48,000	28
3–3775	Wabash River at Mount Carmel, Ill.	28,600	26,310	8,453	206	-31	9,420	6,100	31
3–4690	French Broad River below Douglas Dam, Tenn.	4,543	[1] 6,528	5,860	167	+7	.....	.....	...
4–0845	Fox River at Rapide Croche Dam, near Wrightstown, Wis.[2]	6,150	4,142	2,400	113	-31	.....	.....	...
02MC002 (4–2643.31)	St. Lawrence River at Cornwall, Ontario–near Massena, N.Y.[3]	299,000	239,100	289,000	123	+3	293,000	189,000	31
050115	St. Maurice River at Grand Mere, Quebec.	16,300	24,900	17,100	94	-16	20,100	13,000	27
5–0825	Red River of the North at Grand Forks N. Dak.	30,100	2,439	2,219	163	+4	2,350	1,500	31
5–3300	Minnesota River near Jordan, Minn ..	16,200	3,306	413	43	-18	425	270	30
5–3310	Mississippi River at St. Paul, Minn ...	36,800	[1] 10,230	5,524	88	-12	6,330	4,100	28
5–3655	Chippewa River at Chippewa Falls, Wis.	5,600	5,062	2,183	84	-42	.....	.....	...
5–4070	Wisconsin River at Muscoda, Wis	10,300	8,457	5,176	94	-35	.....	.....	...
5–4465	Rock River near Joslin, Ill	9,520	5,288	2,679	102	-27	2,620	1,700	31
5–4745	Mississippi River at Keokuk, Iowa ...	119,000	61,210	29,940	94	...	34,900	22,600	31
5–4855	Des Moines River below Raccoon River at Des Moines, Iowa.	9,879	3,796	378	42	-55	330	210	31
6–2145	Yellowstone River at Billings, Mont.	11,795	6,754	5,183	131	+2	6,000	3,880	31
6–9345	Missouri River at Hermann, Mo	528,200	78,480	79,630	144	-14	75,800	49,000	27
7–2890	Mississippi River near Vicksburg, Miss.[4]	1,144,500	552,700	441,400	167	+18	615,000	397,000	31
7–3310	Washita River near Durwood, Okla ..	7,202	1,379	509	100	-37	447	290	31
8–3130	Rio Grande at Otowi Bridge, near San Ildefonso, N.Mex.	14,300	1,530	503	125	-46	.....	.....	...
9–3150	Green River at Green River, Utah ...	40,600	6,369	2,032	82	-4	2,500	1,620	31
11–4255	Sacramento River at Verona, Calif ...	21,257	18,370	15,700	179	-14	15,600	10,100	28
13–2690	Snake River at Weiser, Idaho	69,200	17,670	16,980	117	+21	17,100	11,100	27
13–3170	Salmon River at White Bird, Idaho ..	13,550	11,060	6,879	141	+21	8,300	5,360	26
13–3425	Clearwater River at Spalding, Idaho .	9,570	15,320	8,080	212	-23	11,100	7,200	28
14–1057	Columbia River at The Dalles, Oreg.[5]	237,000	194,000	115,800	115	+4	.....	.....	...
14–1910	Willamette River at Salem, Oreg	7,280	23,370	16,800	156	+45	27,960	18,100	27–31
15–5155	Tanana River at Nenana, Alaska	25,600	24,040	20,810	128	-44	15,000	9,700	31
8MF005	Fraser River at Hope, British Columbia.	78,300	95,300	69,700	91	-16	71,600	46,300	30

[1] Adjusted.

[2] Records furnished by Corps of Engineers.

[3] Records furnished by Buffalo District, Corps of Engineers, through International St. Lawrence River Board of Control. Discharges shown are considered to be the same as discharge at Ogdensburg, N.Y. when adjusted for storage in Lake St. Lawrence.

[4] Records of daily discharge computed jointly by Corps of Engineers and Geological Survey.

[5] Discharge determined from information furnished by Bureau of Reclamation, Corps of Engineers, and Geological Survey.

*The U.S. station numbers as listed in this table are in a shortened form previously in use, and used here for simplicity of tabular and map presentation. The full, correct number contains 8 digits and no punctuation marks. For example, the correct form for station number 1–3185 is 01318500.

basin of San Juan River, monthly mean discharge at the index station near Bluff, Utah, also decreased sharply and was about one-half the October median flow. Similarly, in northeastern New Mexico, monthly mean flow during October at the index station, Pecos River at Santa Rosa, was only about half the median for the month and was below the normal range. By contrast, in southwestern New Mexico, where monthly mean flow of Gila River near Gila was highest of record in September, high carryover flow held mean discharge in October in the above-normal range.

Storage in most of the major reservoirs in the region was near or above average at monthend. The net decrease in storage in the Colorado River Storage Project was 347,360 acre-feet.

Ground-water levels generally declined in Montana, in northern and southwestern Idaho, and in north-central Nevada; and changed only slightly in key wells in Washington. Levels rose in most of Utah and at Atomic City in southeastern Idaho; and rose or changed only slightly in southern Arizona and New Mexico. Monthend levels remained below average in southern New Mexico, except for above-average levels in the key well in the Mimbres valley. Monthend levels were generally above average in Montana, eastern Washington, north-central and east-central Nevada, and in key wells in northern Idaho (Rathdrum Prairie) and southern Idaho—in Quaternary sand and gravel deposits at Meridian and Snake River Group at Atomic City. Levels were below average in Utah except for above-average levels in the northeastern and southeastern parts of the State.

ALASKA

Streamflow continued to decrease seasonally at all index stations in the State and monthly mean discharges remained within the normal range except in the south-central and east-central parts, where mean flows of Little Susitna River near Palmer and Tanana River at Nenana remained above the normal range as a result of high carryover flows from September, and above-normal temperatures which prevented the usual October freeze-up. In interior Alaska, temperatures decreased rapidly near monthend, resulting in partial ice cover and sharply reduced streamflow.

Ground-water levels in the Anchorage area rose 1 to 2 feet in most wells tapping deep confined aquifers. However, north of the city, termination of artificial recharge resulted in rapid water-level declines in the Ship Creek fan area.

WATER RESOURCES REVIEW

OCTOBER 1975

Based on reports from the Canadian and U.S. field offices; completed November 6, 1975

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EXPLANATION OF DATA

Cover map shows generalized pattern of streamflow for October based on 22 index stream-gaging stations in Canada and 130 index stations in the United States. Alaska and Hawaii inset maps show streamflow only at the index gaging stations which are located near the points shown by the arrows.

Streamflow for October 1975 is compared with flow for October in the 30-year reference period 1931–60 or 1941–70. Streamflow is considered to be *below the normal range* if it is within the range of the low flows that have occurred 25 percent of the time (below the lower quartile) during the reference period.

Flow for October is considered to be *above the normal range* if it is within the range of the high flows that have occurred 25 percent of the time (above the upper quartile).

Flow higher than the lower quartile but lower than the upper quartile is described as being within the *normal range.* In the Water Resources Review the median is obtained by ranking the 30 flows of the reference period in their order of magnitude; the highest flow is number 1, the lowest flow is number 30, and the average of the 15th and 16th highest flows is the median.

The normal is an average (but not an arithmetic average) or middle value; half of the time you would expect the October flows to be below the median and half of the time to be above the median. Shorter reference periods are used for the Alaska index stations because of the limited records available.

Statements about *ground-water levels* refer to conditions near the end of October. Water level in each key observation well is compared with average level for the end of October determined from the entire past record for that well or from a 20-year reference period, 1951–70. *Changes in ground-water levels,* unless described otherwise, are from the end of September to the end of October.

The Water Resources Review is published monthly. Special-purpose and summary issues are also published. Issues of the Review are free on application to the Water Resources Review, U.S. Geological Survey, Reston, Virginia 22092.

METRIC EQUIVALENTS OF UNITS USED IN THE WATER RESOURCES REVIEW

(Round-number conversions, to nearest four significant figures)

1 foot = 0.3048 metre 1 mile = 1.609 kilometres
1 acre = 0.4047 hectare = 4,047 square metres
1 square mile (sq mi) = 259 hectares = 2.59 square kilometres (sq km)
1 acre-foot (ac-ft) = 1,233 cubic metres
1 million cubic feet (mcf) = 28,320 cubic metres
1 cubic foot per second (cfs) = 0.02832 cubic metres per second = 1.699 cubic metres per minute
1 second-foot-day (cfsd) = 2,447 cubic metres per day
1 million gallons (mg) = 3,785 cubic metres = 3.785 million litres
1 million gallons per day (mgd) = 694.4 gallons per minute (gpm) = 2.629 cubic metres per minute = 3,785 cubic metres per day

The abstract, table, and map below are from the report, *Summary appraisals of the Nation's ground-water resources--Upper Mississippi Region*, by R. M. Bloyd, Jr.: U.S. Geological Survey Professional Paper 813-B, 22 pages, 1975. The report--a discussion of ground-water development and management opportunities in the region--may be purchased for $0.35 from Branch of Distribution, U.S. Geological Survey, 1200 South Eads St., Arlington, VA 22202 (check or money order payable to U.S. Geological Survey); or from Superintendent of Documents, Government Printing Office, Washington, D.C. 20402 (GPO Stock Number 024-001-02688-1), payable to Superintendent of Documents.

ABSTRACT

The Upper Mississippi Region (fig. 1) in general is rich in water--surface water is plentiful, and ground water is a large, important, and manageable resource. Total potable water in storage in the outwash and alluvial aquifers of the Mississippi River valley and the subbasins is about 45,000 billion gallons. This is about 10 percent of the water in storage in Lake Ontario. Water in storage in other aquifers of the region is probably at least several times that in the outwash and alluvial aquifers. Estimated ground-water recharge in the subbasins is 23,000 million gallons per day (table 1).

A comparison of ground-water withdrawals with estimated ground-water recharge suggests that the large ground-water resource of the region is not being fully utilized. Ground-water use by domestic, commercial, and rural interests is only 4 percent of recharge. Ground-water use (1965) by industry is only 3 percent of recharge.

Water in the outwash and alluvial aquifers of much of the valley of the Mississippi River in and south of St. Paul, Minn., of the Illinois River, the Lower Minnesota River, the Wisconsin River, the Lower Black River, the Wapsipinicon River, the Lower Rock River, and the Upper Des Moines River can be considered a regional resource. In these areas the ground-water resources are of sufficient magnitude to satisfy more than just local needs. For example, under certain specified conditions, ground water in the above areas can supply approximately 20 million additional people. Factors other than water supply, of course, will be constraints on development in the region.

Advances in techniques in ground-water hydrology during recent years have provided methods that the hydrologist and planner can use for planning and design of ground-water developments. Therefore, the planner can now resolve some of the development and management questions that historically have bred uncertainty when this part of the water resource was considered for development.

Table 1.--*Comparison of ground-water withdrawals with estimated ground-water recharge, in million gallons per day*

	Subbasin	Total[1] withdrawal	Estimated ground-water recharge
1.	Mississippi headwaters	97	4,700
2.	Chippewa-Black	33	2,200
3.	Wisconsin	47	2,900
4.	Rock	113	3,000
5.	Illinois	229	2,900
6.	Kaskaskia	20	700
7.	Big Muddy	5	150
8.	Meramec	20	1,250
9.	Salt	13	150
10.	Fox-Wyaconda-Fabius	6	100
11.	Des Moines	71	700
12.	Skunk	24	400
13.	Iowa-Cedar	89	1,250
14.	Turkey-Maquoketa-Upper Iowa-Wapsipinicon	51	1,400
15.	Cannon-Zumbro-Root	32	800
16.	Minnesota	51	550
	Regionwide industrial use	629	.....
	Totals	1,530	23,150

[1]Summation of base year (1960) domestic and commercial ground-water use, rural water use, and basinwide industrial ground-water use(1965).

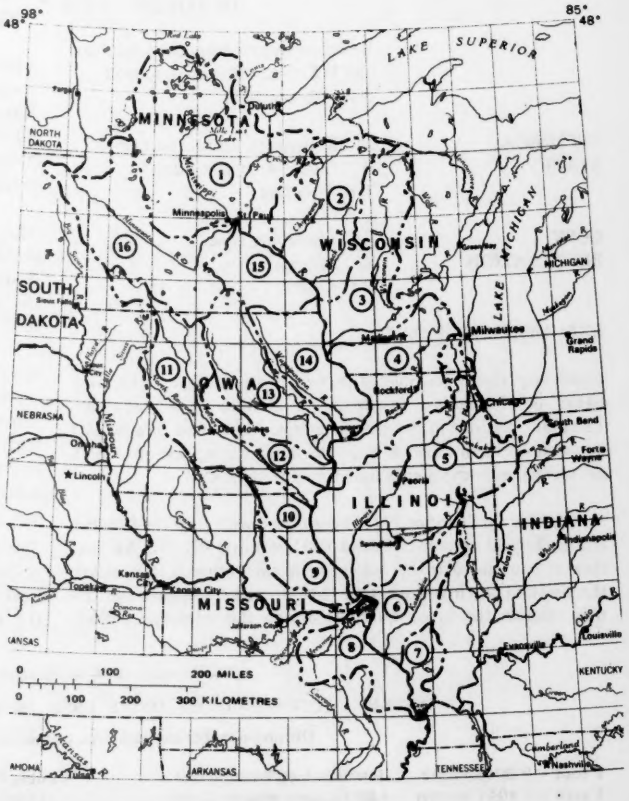

Figure 1.--Location of subbasins in Upper Mississippi Region.